

American Beryllium Exposure Investigation

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Background:

Between 1961 and 1996, the Loral American Beryllium Company, located in Manatee County, Florida, specialized in the production of close-tolerance beryllium components for the aerospace and defense industry. Former workers, their families, and community residents were concerned about their exposure to beryllium dust, which can result in beryllium sensitization (BeS) and chronic beryllium disease (CBD).

BeS is an asymptomatic condition where exposed individuals have developed a delayed-type hypersensitivity to beryllium. Immunologic sensitization has been reported to range from 1% to 16% among exposed workers, depending on the job tasks performed.

CBD is a chronic granulomatous lung disease similar in its disease presentation to sarcoidosis. Its latency period can range from 3 months to 30 years. CBD is treatable, but not curable, with mortality rate as high as 38% if left untreated. Symptoms include cough, chest pain, shortness of breath, and fatigue.

The Manatee County Health Department (CHD) and the Florida Department of Health (DOH) responded to these concerns by testing a total of 359 participants using a blood test called the beryllium lymphocyte proliferation test (BeLPT). See **Table 2** in the total number of participants, by exposure category.

The Agency of Toxic Substances and Disease Registry (ATSDR) then conducted an exposure investigation to retest participants who had an abnormal, borderline, or uninterpretable initial BeLPT. Retesting is essential and recommended in confirming beryllium sensitization.

Methods:

The BeLPT is a screening test used to identify individuals who have developed an immunologic sensitization to beryllium. It is performed on T-lymphocytes collected from blood or bronchial fluid. These lymphocytes are incubated in three concentrations of beryllium sulfate over two time periods. In the presence of beryllium, sensitized lymphocytes are stimulated to proliferate, increasing the uptake of tritium labeled thymidine. The radioactivity of beryllium-enriched incubations is compared with that of incubations without beryllium, generating six ratios called stimulation indices. Two or more elevated ratios define an abnormal result; one elevated ratio defines a borderline result; and no elevated ratio defines a normal result. An uninterpretable result is reported if the sample is unable to be analyzed.

The Manatee CHD and the Florida DOH obtained 30-mL blood samples on 359 participants and sent these samples to the National Jewish Medical and Research Center in Denver, Colorado, for BeLPT testing.

ATSDR conducted an exposure investigation to retest nine participants who had an abnormal, borderline, or uninterpretable BeLPT result on their initial test. The Sarasota CHD obtained 60-mL blood samples, split into equal aliquots and sent to two labs for incubation and interpretation (National Jewish Medical and Research Center in Denver, Colorado, and Specialty Laboratories in Valencia, California). Manatee CHD also referred two former workers, both abnormal, to the Department of Energy (DOE) for further testing and results are unknown at this time. They also retested two household contacts and results are shown in **Table 2**.

Results were interpreted based on a BeLPT algorithm developed by ATSDR staff. According to the flow diagram in **Figure 1**, a participant would be considered beryllium sensitized if any two of the results are abnormal or borderline.

Results:

Of the nine participants retested by ATSDR, two former workers and one household contact were considered beryllium sensitized. Manatee CHD also retested two household contacts and they were considered sensitized as well. The rate of confirmed sensitization was five (1.4%) of 359 participants overall. Two (2.35%) of 85 former workers met the criteria for beryllium sensitization; however confirmatory results from two other former workers are unknown at this time. Three (2.75%) of 109 household contacts were confirmed beryllium sensitized. No community residents in this exposure investigation were found to be beryllium sensitized.

Conclusions:

Exposed workers at beryllium facilities and their families may be at significant risk of developing beryllium sensitivity and/or chronic beryllium disease. The individuals who were considered sensitized should be evaluated by a pulmonologist and followed closely for signs of clinical progression.

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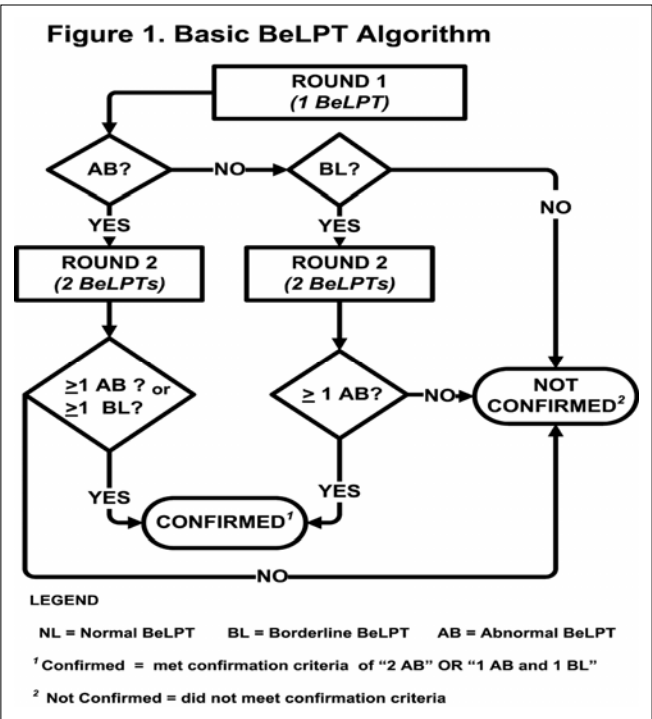
Susan Skye, Florida DOH; Dr. Branic and staff, Manatee CHD; Homer Rice and staff, Sarasota CHD; Dr. Susan Metcalf, Peter Kowalski, ATSDR/DHAC; Dr. Dan Middleton, ATSDR/DHS

Table 1: Total number of participants, by exposure category, for initial BeLPT

	Former Workers	Household Contacts	Community Residents
Manatee CHD	66	55	116
Florida DOH	19	54	49
Totals	85	109	165

Table 2: Repeat BeLPT results obtained by ATSDR

	Initial Test National Jewish Laboratory	Confirmatory Test National Jewish Laboratory	Confirmatory Test Specialty Laboratories	Beryllium Sensitized
Former Worker	Borderline	Insufficient sample	Abnormal	Yes
Former Worker	Borderline	Abnormal	Abnormal	Yes
Former Worker	Abnormal	Normal	Normal	No
Former Worker	Abnormal	Referred to DOE		?
Former Worker	Abnormal	Referred to DOE		?
Household Contact	Abnormal	Abnormal		Yes
Household Contact	Abnormal	Abnormal		Yes
Household Contact	Abnormal	Insufficient sample	Borderline	Yes
Resident	Abnormal	Normal	Normal	No
Resident	Borderline	Normal	Normal	No
Resident	Borderline	Normal	Normal	No
Resident	Borderline	Normal	Normal	No
Resident	Uninterpretable	Normal	Normal	No



References:

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